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11 year zooplankton time-series related to North Atlantic climate changes in waters of the Balearic Sea (western Mediterranean)

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Seasonal and interannual patterns of zooplankton and oceanographic properties of the sea water column (75 m depth) are given for a monitoring station of the Balearic Sea, a boundary hydrographic area of the western Mediterranean. The results are based on 11 year samples collected every ten days during the period from January 1994 to December 2004. Temperature manifested clear seasonal cycles while salinity showed a larger variability modulated by the hydrological regime changes of the Balearic sea waters. During the total period, salinity revealed an increasing trend meanwhile annual temperature did not demonstrate any apparent trend. Zooplankton abundance and composition was in relation to the hydrographic variability and regional climate. Therefore zooplankton can be used as a valuable indicator of further studies of climate change, however the responses varied according to different life-histories of the main zooplankton groups. Yearly, two different periods were observed: the mixing period during winter and early spring, with a higher abundance of organisms and, the increased stratified period characterised by other species of small copepods, cladocerans and meroplankton. The larger period of stratification all along the study area affected the zooplankton structure. Moreover, during cool years a relation was found between strong anomalies of the North Atlantic climate (>1 standard deviation) and the highest zooplankton abundance of the main groups, when cooler northern Mediterranean waters reached the area. On the contrary, warmer years showing the lowest zooplankton abundances (1997–1998 and 2003), were associated with the inflow of less saline and nutrient-depleted more recent Atlantic waters. A downscaling process linking the North Atlantic climate and the hydrographic variability in the Balearic Sea was a proxy of the zooplankton structure. The synchronies in the zooplankton patterns with North Atlantic climate factors showed the fast responses of these organisms to signals of a scale that can be used for further studies of climatic changes. Although the time series analysed covers a relatively short period for investigating climate effects on marine ecosystems, the statistical results reported were consistent enough to stress the North Atlantic climate effect on the Balearic Sea and an ideal place to represent the oceanic western Mediterranean waters where potential consequences of global climate change can be investigated.